



FMCSA Safety Program Effectiveness Measurement: Carrier Intervention Effectiveness Model, Version 1.2—Report for FY 2016 Interventions

BACKGROUND

The Carrier Intervention Effectiveness Model (CIEM) provides the Federal Motor Carrier Safety Administration (FMCSA) with a tool for measuring the safety benefits of carrier interventions conducted under the Compliance, Safety, Accountability (CSA) enforcement program. The CSA program includes an array of carrier intervention types that replace the universally implemented compliance review previously used by the agency. The new enforcement program was designed to improve the level of safety in the operation of commercial motor vehicles.

Using a phased approach, FMCSA began implementing the CSA program in 2010. During implementation, some carriers were still subject to compliance reviews under the earlier enforcement program. The safety impacts of these compliance reviews were previously measured by the Compliance Review Effectiveness Model (CREM). The new model, CIEM, incorporates both compliance reviews and additional intervention types when assessing safety benefits. Additional intervention types include:

- Warning letters.
- Offsite investigations.
- Onsite focused investigations.
- Onsite comprehensive investigations.

This approach yields national-level measurements of the effectiveness of FMCSA’s current carrier interventions. Table 1 shows the safety benefits of all interventions, as calculated by the CIEM, for fiscal years (FYs) 2015–16. In FY 2016, carrier interventions led to an estimated 7,405 crashes prevented, 4,079 injuries prevented, and 214 lives saved.

Table 1. Estimated crashes prevented, injuries prevented, and lives saved from FY 2015–16.

Fiscal Year	Crashes Prevented	Injuries Prevented	Lives Saved
2015	7,136	3,965	212
2016	7,405	4,079	214

MODEL APPROACH

The model computes carrier crash rates, defined as crashes per carrier power unit (PU), for carriers receiving interventions (treatment group carriers) for defined periods before and after interventions. The difference between these carriers’ pre- and post-intervention period crash rates represents the change in their safety performance during this timeframe. To control for systemic differences between small and large carrier operations, these comparisons are made within carrier size groups determined by their PU count. To remove the effect of confounding factors from the calculation of the change in safety performance, the difference between pre- and post-intervention period crash rates is adjusted by the change in crash rates experienced by the general carrier population during a corresponding timeframe. A set of carefully designed filters is used to identify and remove missing and outlier carrier data, prior to running the model estimates.

The model incorporates statistical significance testing and considers only size group changes in crash rates that are statistically significant. Statistically significant results, measured in terms of crashes prevented, injuries prevented, and lives saved, are then extrapolated to incorporate carriers that received interventions but were not included in the initial model calculations, due to missing or inaccurate data.

MODEL FINDINGS

The model was implemented for carriers receiving the specified intervention types in FY 2016. Table 2 presents two sets of data for FY 2016 and the 2 preceding fiscal years. Columns B through D show, by type, the number of interventions conducted by FMCSA and its State partners for each of the three fiscal years. Columns E through G give the number of carriers receiving these intervention types as their first intervention in those fiscal years.

Overall, the set of FMCSA intervention types specified in the model are shown to have reduced motor carrier crash rates in FY 2016 (as in prior years). Consistent with prior years’ results, crash rate reductions are

generally more pronounced for the smaller carrier size groups (see Table 3).

Table 2. Carrier interventions by type, and number of carriers by first intervention.

A	B	C	D	E	F	G
Intervention Type	Number of Interventions FY 2014	Number of Interventions FY 2015	Number of Interventions FY 2016	Number of Carriers Receiving Interventions (by first intervention) FY 2014	Number of Carriers Receiving Interventions (by first intervention) FY 2015	Number of Carriers Receiving Interventions (by first intervention) FY 2016
CSA Warning Letter	20,535	20,443	30,530	20,529	20,437	30,377
Offsite Investigation	381	169	127	334	146	122
Onsite Focused Investigation	7,376	7,911	7,110	6,995	7,471	6,548
Onsite Comprehensive Investigation*	5,891	5,395	5,981	5,587	5,140	5,470
Non-ratable Review	749	777	611	687	740	506
Total	34,932	34,695	44,359	34,132	33,934	43,023

*Compliance reviews are now included as onsite comprehensive investigations.

Table 3. Net percent reductions in crash rates after a carrier received an intervention.

By Carrier Size Group	FY 2014	FY 2015	FY 2016
1 (1–5 power units)	47.0%	53.4%	47.7%
2 (6–20 power units)	35.5%	37.2%	34.5%
3 (21–100 power units)	20.9%	22.4%	19.2%
4 (100+ power units)	0.2%*	1.2%*	1.1%*

Note: Negative crash rate reductions indicate increases in crash rates.

*Non-statistically significant net reduction.

Version 1.2 of the model now estimates safety benefits associated with individual intervention types. (Carriers receiving more than one type of intervention

during the fiscal year are assigned an intervention type, based on the nature of the first intervention it received during that year). Benefits associated with each intervention type are presented in Table 4.

In summary, the FY 2016 data on pre- and post-intervention safety performance provide evidence for the effectiveness of FMCSA’s carrier interventions, as in previous years. Future implementation of the model will enable FMCSA to continue to measure the impacts of carrier interventions conducted by the agency.

To read the complete report, please visit: <https://rosap.ntl.bts.gov/view/dot/53621>

Table 4. Estimated crashes avoided, injuries prevented, and lives saved, by investigation type, FY 2016.*

Intervention Type	All Carriers Receiving Interventions: Number of Carriers	Crashes Prevented	Injuries Prevented	Lives Saved
Onsite Focused	6,548	1,193	657	35
Onsite Comprehensive	5,470	902	497	26
Offsite Focused	122	0	0	0
Non-ratable Review	506	0	0	0
Warning Letter	30,377	5,385	2,966	156

* Note: Due to model calculations being performed at a finer level of granularity, estimated safety benefits associated with each intervention type may not add up to the totals shown in Table 1.